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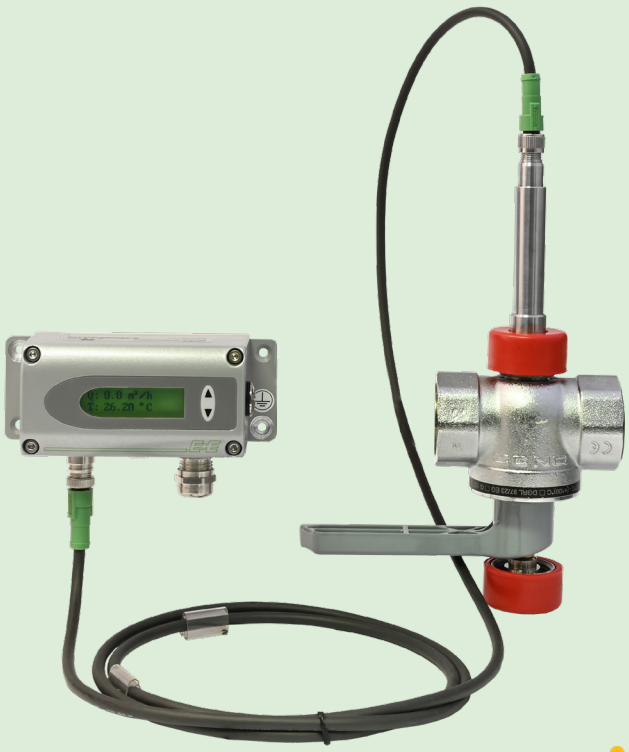
User Manual EE771

Flow Sensor for Compressed Air and Gases DN15 (1/2") - DN50 (2")



Modbus

M-Bus

www.epluse.com

Content

1 General Information

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. E+E Elektronik Ges.m.b.H. does not accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

All information, technical data and diagrams included in this document are based on the information available at the time of writing. It may contain technical inaccuracies and typographical errors. The contents will be revised on a regular basis and changes will be implemented in subsequent versions. The described product(s) and the contents of this document may be changed or improved at any time without prior notice.

PLEASE NOTE

Find this document and further product information on our website at www.epluse.com/ee771.

1.1 Explanation of Warning Notices and Symbols

Safety precautions

Precautionary statements warn of hazards in handling the device and provide information on their prevention. The safety instruction labeling is classified by hazard severity and is divided into the following groups:

DANGER

Danger indicates hazards for persons. If the safety instruction marked in this way is not followed, the hazard will very likely result in severe injury or death.

WARNING

Warning indicates hazards for persons. If the safety instruction marked in this way is not followed, there is a risk of injury or death.

CAUTION

Caution indicates hazards for persons. If the safety instruction marked in this way is not followed, minor or moderate injuries may occur.

NOTICE

Notice signals danger to objects or data. If the notice is not observed, damage to property or data may occur.

Informational notes

Informational notes provide important information that stands out due to its relevance.

INFO

The information symbol indicates tips on handling the device or provides additional information on it. The information is useful for reaching optimal performance of the device.

The title field can deviate from “INFO” depending on the context. For instance, it may also read “PLEASE NOTE”.

1.2 Safety Instructions

1.2.1. General Safety Instructions

NOTICE

Improper handling of the device may result in its damage.

- The EE771 enclosure, the sensing probe and the sensing module shall not be exposed to unnecessary mechanical stress.
- Do not apply the supply voltage to the RS485 data lines.
- Use the EE771 only as intended and observe all technical specifications.

1.2.2. Intended Use

The flow sensor is intended to be used for the measurement of air and other non-corrosive gases in pipelines only. Please consult E+E Elektronik if measurement shall be carried out in wet or filthy gases.

The EE771 flow sensor design allows for measurement in a pressurized system up to PN16 (16 bar / 230 psi).

⚠ WARNING

Non-compliance with the product documentation may cause safety risks for people and the entire measurement installation.

- Prior to the start of the installation, the system has to be depressurized. Before installing or removing the probe or screw cap, the measurement ball valve should be closed.
- Mounting, electrical installation, putting in operation and maintenance should only be done by qualified personnel.
- The use of the flow sensor EE771 in any other way than described in this manual bears a safety risk for people and the entire measurement installation and is therefore not allowed.
- The manufacturer cannot be held responsible for damages as a result of incorrect handling, installation, and maintenance of the equipment.
- To avoid health risks or damage to the equipment, the installation should not be operated on with tools, which are not specifically mentioned or described in this manual.
- Excessive mechanical stress and inappropriate handling must be avoided.
- A short interruption of the flow using the measurement ball valve cannot be avoided when exchanging the sensing probe.
- The flow sensor can only be utilized in accordance with the conditions defined in the technical data. Otherwise, inaccuracies in the measurement will occur and equipment failures cannot be ruled out.
- For the safety of the user and for the functionality of the equipment the recommended steps by the manufacturer to put into operation, to test and to maintain should be taken and completed.

NOTICE

Failing to follow the instructions in this user manual may lead to measurement inaccuracy and device failures.

- The EE771 may only be operated under the conditions described in this user manual and within the specification included in chapter 9 Technical Data.
- Unauthorised product modifications result in the loss of all warranty claims. Modifications may only be made with the explicit authorisation of E+E Elektronik Ges.m.b.H.!

1.2.3. Mounting, Start-up and Operation

The EE771 has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a way that does not impair its safe use. The user is responsible for observing all applicable local and international safety guidelines for safe installation and operation of the device. This user manual contains information and warnings that must be observed by the user in order to ensure safe operation.

PLEASE NOTE

The manufacturer or his authorized agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the specified operating conditions. Consequential damages are excluded from the liability.

WARNING

Non-compliance with the product documentation may cause accidents, personal injury or property damage.

- Mounting, installation, commissioning, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorized by the operator of the facility to carry out the mentioned activities.
- The qualified staff must have read and understood this user manual and must follow the instructions contained within.
- All process and electrical connections shall be thoroughly checked by authorized staff before putting the device into operation.
- Disconnect the device from power supply before opening or closing to avoid damages.
- Do not install or start-up a device supposed to be faulty. Ensure that such devices are not used accidentally by clearly marking them as faulty.
- A faulty device shall be removed from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer.

1.3 Environmental Aspects

PLEASE NOTE

Products from E+E Elektronik Ges.m.b.H. are developed and manufactured in compliance with all relevant environmental protection requirements. Please observe local regulations for the disposal of the device.

For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

2 Scope of Supply

- EE771 Flow Sensor for Compressed Air and Gases DN15 (1/2") - DN50 (2") according to the Ordering Guide
- Inspection certificate according to DIN EN 10204-3.1
- User Manual

3 Product Description

3.1 General

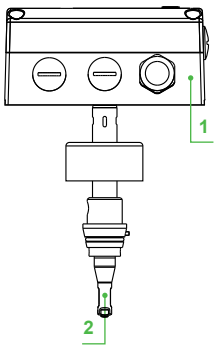
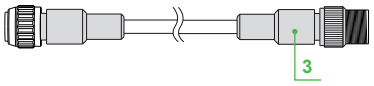
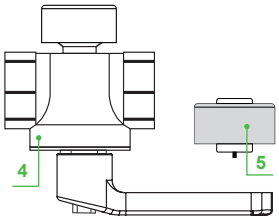
The EE771 flow sensor operates on the thermal mass flow measurement principle and is suitable for measuring the flow of compressed air and gases in pipelines. Gases can be e.g. air, nitrogen, argon, CO2 or other non-corrosive and non-flammable gases.

The EE771 measures flow velocity and volume flow at standard conditions according to DIN 1343 (pn = 1013.25 mbar (14.7 psi); Tn = 0 °C (32 °F)). Additionally, it measures mass flow, consumption and temperature. The value of the integrated consumption meter is not lost after a power failure.

Two signal outputs are available. Depending on the ordered version, the outputs can be configured as analogue (current or voltage) output, as switch output or as pulse output for consumption metering and optionally with additional digital interface (Modbus RTU or M-Bus).

The freely available configuration software can be used to configure all outputs, to perform sensor adjustment, to change process parameters and standard conditions, to enter the current process pressure for compensation and to set the communication parameters of the digital interface.

The measured data is indicated on the optional display, with selectable measurands to be displayed. Please refer to chapter 6.3 Display / Indicator with Keypad (Optional).

Description	Associated Numbering
1. Signal conditioning with optional display The enclosure with the signal conditioning is mounted either on the measurement probe (type T19 or T20 compact) or is remote with a pluggable sensor cable up to 10 m (33 ft) (type T3 with remote probe).	
2. Sensing probe with measurement electronics The interchangeable sensing probe contains the sensor element and the measurement electronics, in which the data of the factory calibration is stored. The sensing probe is easy and quickly interchangeable in the field, independent of the electronics for the signal conditioning. After the exchange, the configuration of the outputs is unchanged.	
3. Sensor cable (only for type T3 with remote sensing probe) The sensor cable allows for the remote installation, up to 10 m (33 ft) of the sensing probe from the enclosure with the signal conditioning.	
4. Measurement valve with shut-off function The measurement ball valve assembly allows for easy and reliable installation within the pipeline. During the installation in the pipeline, the required inlet and outlet paths (see chapter 4.3 Required Length of Straight Pipe) should be observed. The nominal size of the measurement ball valve assembly must match the nominal size of the pipe. The measurement valve with shut-off function allows the sensor to be installed and removed with only a brief interruption to the process flow. The measurement ball valve assembly is suitable for pressures up to 16 bar (PN16) and available for pipe diameters DN15 (1/2") to DN50 (2").	
5. Screw cap The screw cap, with female thread, is screwed in place if the flow sensor is not installed and the pipeline has to be used.	

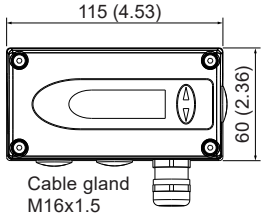
Tab. 1 Parts description

3.2 Dimensions

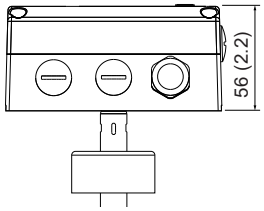
Values in mm (inch)

EE771 compact

Type T19, T20

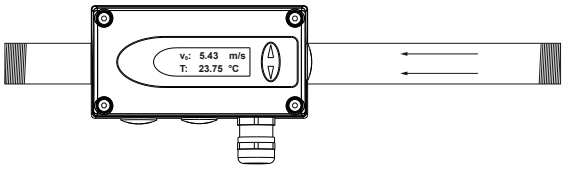


Type T19, T20

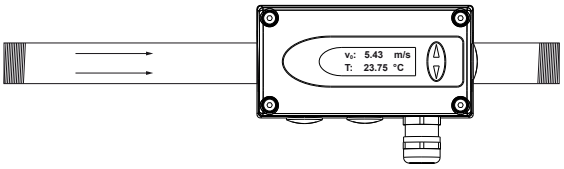


EE771 compact

Type T19: flow direction right to left

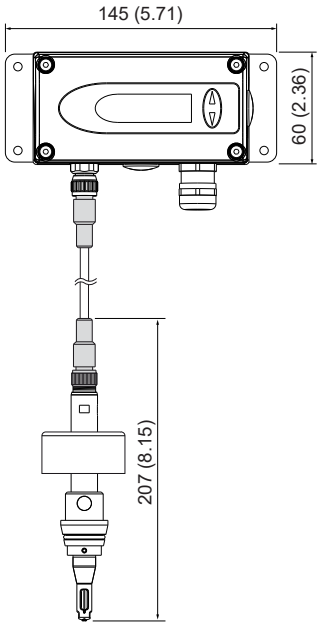


Type T20: flow direction left to right

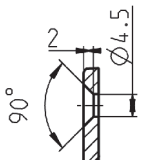


EE771 remote

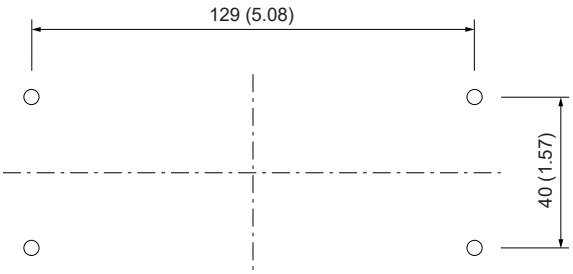
Type T3:



Cross-section bore hole

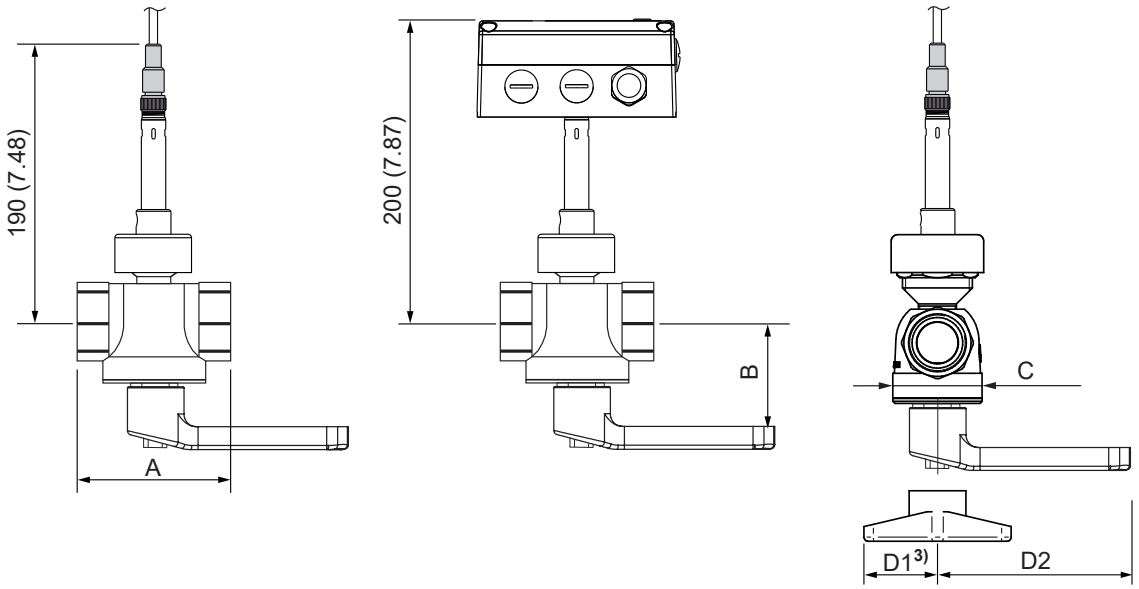


Drilling plan



The bottom part of the enclosure is mounted with 4 screws (not in the scope of supply). Max. screw diameter: 4.5 mm (0.17 inch), e.g. 4.2 x 38 mm DIN 7938H screws

Measurement valve with shut-off function



Valve	Thread[1)]	A	B	C	D1[3)]	D2	ISO	NPT
DN15	R_p1/2"	100±8 (3.94±0.32)[2)]	55 (2.28)	43 (1.69)	36 (1.46)	92 (3.62)	HA075015	Not available
DN20	R_p or NPT 3/4"	73 (2.83)	55 (2.28)	43 (1.69)	36 (1.46)	92 (3.62)	HA075020	HA175020
DN25	R_p or NPT 1"	88 (3.27)	67 (2.28)	52 (2.00)	48 (1.73)	125 (4.92)	HA075025	HA175025
DN32	R_p 1 1/4"	100 (3.94)	77 (2.64)	62 (2.44)	–	125 (4.92)	HA075032	Not available
DN40	R_p or NPT 1 1/2"	110 (4.33)	83 (3.27)	74 (2.91)	–	147 (5.79)	HA075040	HA175040
DN50	R_p or NPT 2"	131 (5.16)	88 (3.46)	90 (3.54)	–	147 (5.79)	HA075050	HA175050

1) Female thread: BSP thread acc. to EN 10226 (old DIN 2999) or NPT.
2) Including reduction 3/4" - 1/2"
3) Phasing out, mixed deliveries are possible in the transition phase.

Tab. 2 Dimensions

3.3 Display

EE771 is available with an optional 2-line liquid crystal display and soft keys. Please find details on capabilities and operation in chapter 6.3 Display / Indicator with Keypad (Optional).

4 Mounting and Installation

4.1 Determining Installation Site

- The installation site should be easy to access and free of vibrations and shocks.
- A clearance of at least 120 mm (5 inches) must be maintained above the enclosure with signal conditioning, this will enable removal of the sensor if necessary.
- The ambient temperature should not exceed the value as stated in the specifications (please refer to chapter 1 General Information) – consider heating by radiation.
- Air purity on the installation site according to ISO 8573-1:2010: at least class 3.4.4
- The fluid should not condense at the installation site. Condensation on the tip of the sensing probe must be avoided.
- In compressed air systems, the installation must be downstream of the dryer. In case of no dryer, there must at least be a steam trap and suitable filters.
- The direction of the flow by the installation (see chapter 4.4 Assembly of the Measurement Ball Valve) must be observed.
- The recommended straight pipe lengths up and downstream must be observed, in order to warrant the specified measurement accuracy.
- The flow sensor should be installed as far as possible from any flow disturbance. Valves or check-valves should be installed in a respective distance from the flow sensor.

4.1.1. Process Pressure

Due to its measurement principle, the thermal mass flow sensor EE771 is largely independent of the process pressure and is factory calibrated at a pressure of 7 bar (100 psi).

In order to achieve the highest measurement accuracy, the slight dependence on process pressure can be compensated for in two ways:

- If the process pressure is stable, by programming the pressure value in the configuration software (see chapter 10.5.6 Setting up Process Parameters).
- In case of strong fluctuations of the process pressure (e.g. 3...10 bar (40...150 psi)), an external pressure sensor can be installed and connected to the pressure compensation input (see chapter 10.5.7 External Pressure Sensor for Pressure Compensation).

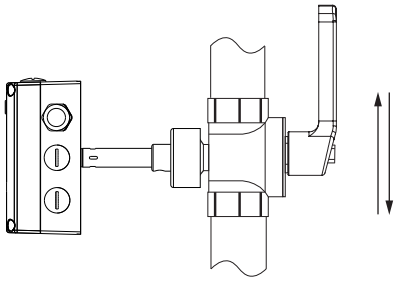
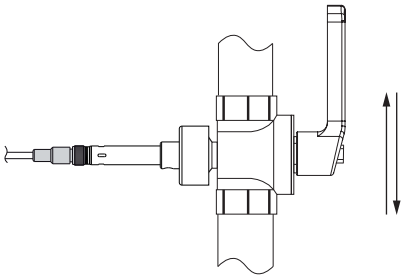
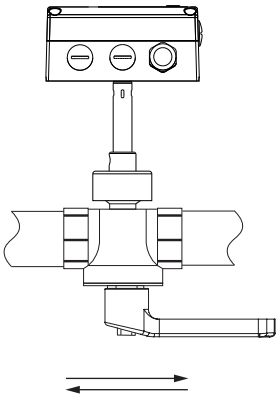
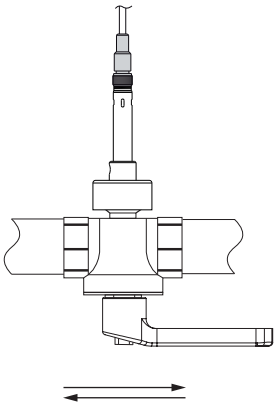
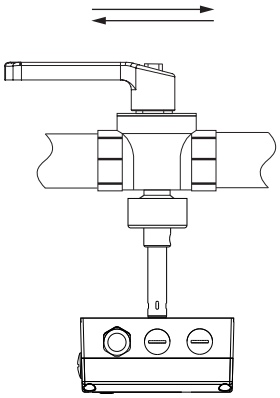
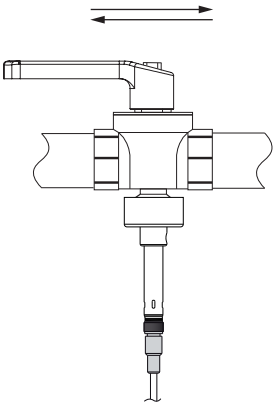
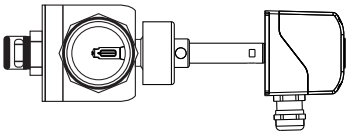
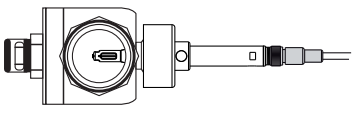
⚠ WARNING

Modifying the measuring system in a pressurised piping system may cause safety risks for people and the entire measurement installation.

In order to install, modify or remove the measurement section the pipeline system should be depressurized.

4.2 Installation Position

Make sure that the arrow on the tip of the sensing probe is pointing in the direction of the flow.

Mounting		Type: Compact	Type: Remote
Vertical			
		+	++
Horizontal, sensor upwards			
		++	++
Horizontal, sensor downwards			
		-	-
Horizontal mounting, sensor across			
		+	++

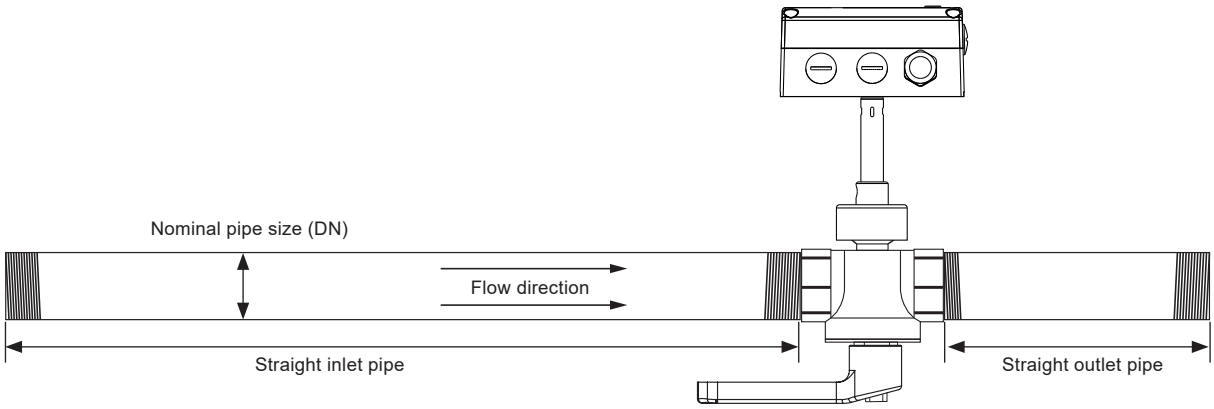
++ ... Recommended installation position
+ ..... Not recommended if there is vibration on the pipeline
- ..... Not recommended

Tab. 3 Correct sensor position

4.3 Required Length of Straight Pipe

The flow sensor should be installed as far as possible from disturbances of the flow. The causes for disturbance of the flow are for instance reducers, elbows, T-pieces, valves, gate valves, etc. The specified measurement accuracy can be achieved only when the following straight inlet and outlet pipe lengths are installed:

- The wall thickness of the inlet and outlet pipe should be 2.6 mm (0.1").
- The stated values are a minimum. If possible, larger distances should be planned.
- Valves or gate valves should be installed downstream of the flow sensor.
- With lighter gases the inlet straight pipe should be longer.



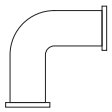
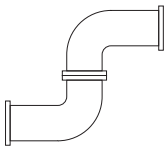
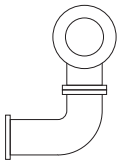
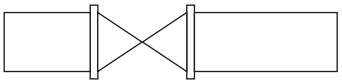
Types of pipes		DN = Nominal Pipe Size Straight Inlet pipe	Straight Outlet pipe
	Extension	15 x DN	5 x DN
	Reduction	15 x DN	5 x DN
	90° - elbow	20 x DN	5 x DN
	Two 90° - elbows, in one level	25 x DN	5 x DN
	Two 90° - elbows, in two levels, T-piece	30 x DN	5 x DN
	Valve, gate valve	50 x DN	5 x DN

Fig. 1 Optimum conditions to achieve the specified measurement accuracy

4.4 Assembly of the Measurement Ball Valve

NOTICE

- All connections must be made with appropriate sealing material on the threads.
- The sealing material should not change the area of the inner cross section of the pipe. It must be ensured that the connections are leak-free after installation.
- All fittings must be tested for seal tightness.
- During the assembly of the measurement section, it has to be ensured that the arrows on the pipe section and the measurement ball valve are pointing in the same direction as the flow.
- The recess for the alignment pin must be at the side of the outlet.

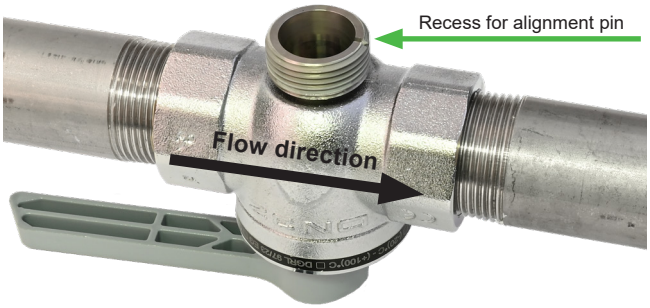
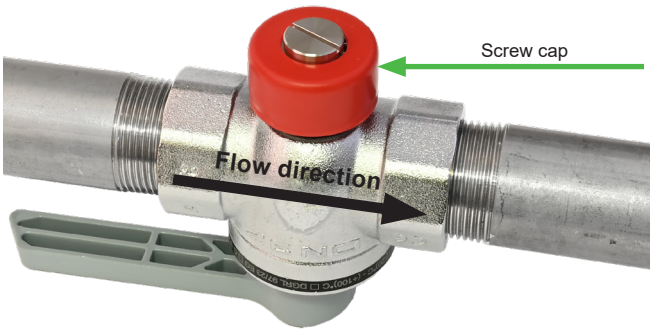


Fig. 2 Position of the recess for the alignment pin

4.4.1. Assembly without Flow Sensor, but With Screw Cap Instead (Blind Cap)



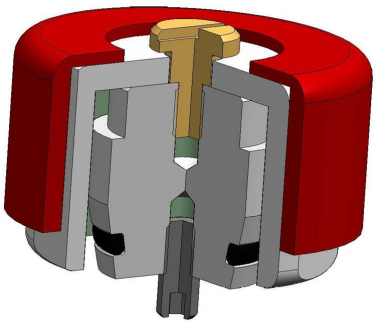


Fig. 3 Screw Cap

In order to use the measurement section without the flow sensor, the blind screw cap (in the scope of supply) must be screwed tight onto the opening of the measurement ball valve.

Tighten the red coloured retainer nut by hand. Hand-tightening should be sufficient.

NOTICE

If the seal is not leak tight, carefully tighten the nut a little further using a suitable tool.
Maximum torque 25 Nm!

If the screw cap is not needed, it can be screwed onto the handle of the measurement valve with shut-off function and stored.

4.4.2. Shut Off the Measurement Ball Valve

The measurement ball valve assembly allows for the installation and removal of the flow sensor within seconds, with only a very short interruption of the flow.

Fig. 4 Ball valve position open and closed

⚠ WARNING

Working with a pressurised piping system may cause safety risks for people and the entire measurement installation.

Never remove the flow sensor or the blind screw cap while the measurement ball valve is open.

4.5 Installation of the Flow Sensing Probe

4.5.1. Flow Direction

The flow direction is indicated by an arrow on the tip of the probe. Due to the alignment pin, installation of the sensing probe in the measurement ball valve is only possible in the direction of flow. After removal, the sensing probe will be re-installed in the measurement section at exactly the same position as done at the factory. Maximum reproducibility is therefore guaranteed.

4.5.2. Installation of the Sensing Probe

Fig. 5 Correct sensor position in flow direction

⚠ WARNING

Working with a pressurised piping system may cause safety risks for people and the entire measurement installation.

Make sure that the measurement ball valve is shut off.

1. Remove the transport protection cap of the head of the sensing probe.
2. Mount the sensing probe in the measurement valve with shut-off function in a way that the alignment pin fits into the recess on the measurement ball valve.
3. Screw the retainer nut by hand until a certain amount of resistance can be felt.

Fig. 6 Correct installation position of the flow sensor

4. Check the correct installation position of the flow sensor. The alignment pin must fit in the recess on the measurement ball valve.

NOTICE

If the seal is not leak tight, carefully tighten the nut a little further using a suitable tool.
Maximum torque 25 Nm!

5. The mechanical installation of the flow sensor is now complete.

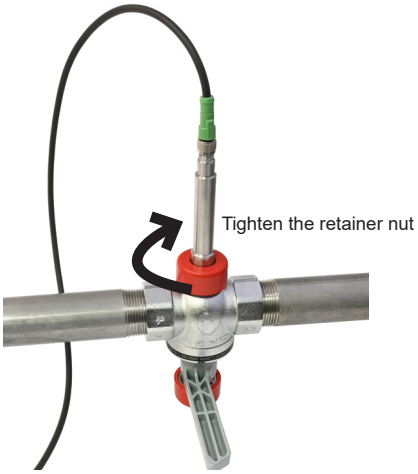


Fig. 7 Fixation of the flow sensor

5 Electrical Connection

NOTICE

The power supply must be switched off before the electrical connection is made. If not observed, the electronics can be damaged as a result. Only a qualified electrical engineer may install the device.

- Unscrew the four screws and remove the cover of the enclosure.
- The screw terminals are located in the bottom part of the enclosure.
- For the electrical connection of the flow sensor a 6-wire cable is needed (e.g. 6x1 mm^2 (AWG 17))

5.1 Connection Diagram

⚠ WARNING

Incorrect installation, wiring or power supply may cause overheating and therefore personal injuries or property damage.

- For correct cabling of the device, always observe the presented wiring diagram for the product version used.
- The manufacturer cannot be held responsible for personal injuries or property damage as a result of incorrect handling, installation, wiring, power supply or maintenance of the device.

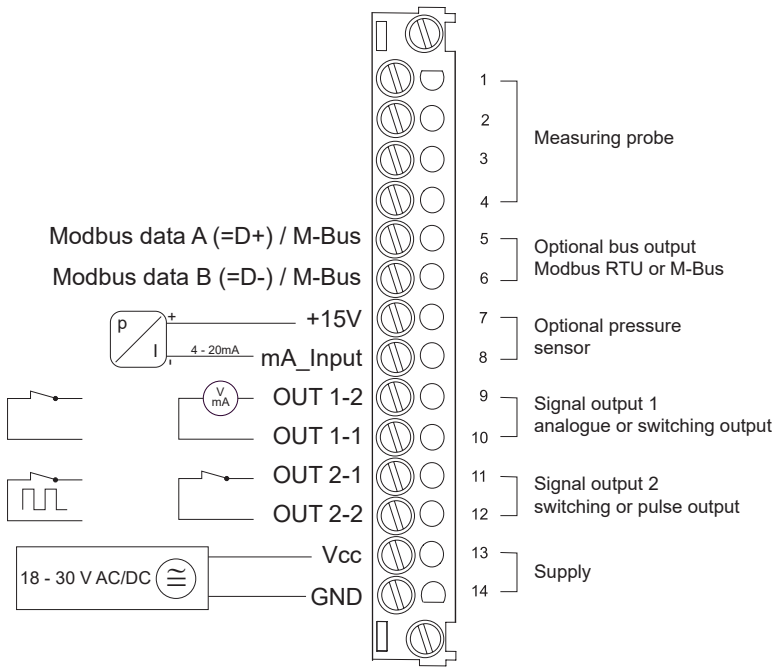
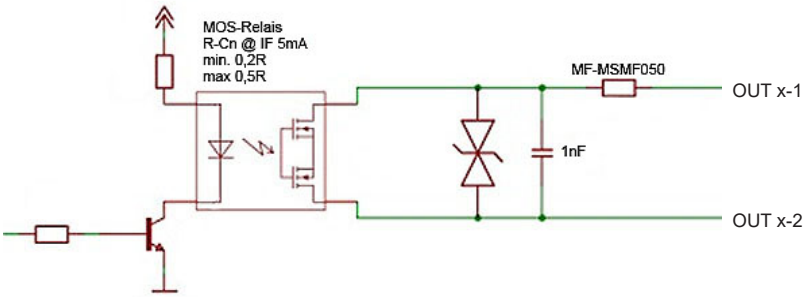


Fig. 8 EE771 connection options

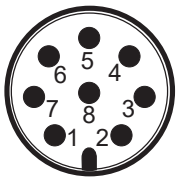
- Screw terminal OUT 1-1 for the analogue output is internally connected with GND.
- The enclosure should be grounded to achieve optimal electromagnetic compliance.

5.1.1. Relay and Pulse Output, Internal Switching



The relay switch and pulse outputs are potential free.

5.1.2. Connection with Optional Plug for Power Supply and Outputs (Order Code E4)



Connection plug for the power supply and analogue outputs
(rear view of the terminals)

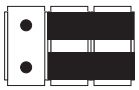
Pin	Assignment
1	OUT 2-2
2	OUT 1-2
3	OUT 1-1
4	GND
5	OUT 2-1
6	n.c.
7	Vcc
8	n.c.

6 Setup and Configuration

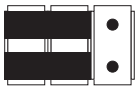
6.1 Jumpers for output configuration

If the signal output is altered from the relay to the analogue output or vice versa, Jumper Output 1 has to be relocated. If the analogue output is altered from a current to a voltage output or vice versa, Jumper Out-1 has to be relocated.

Signal output 1 =
switching output



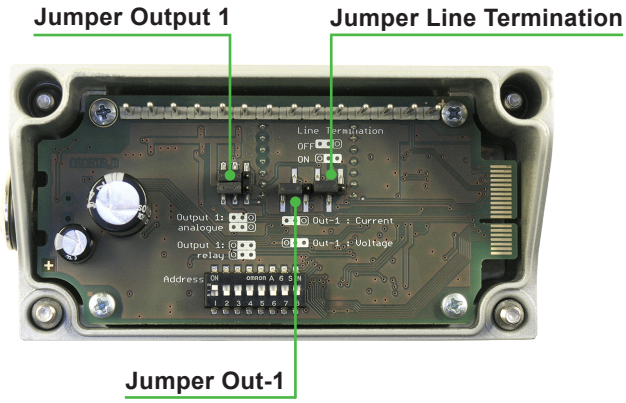
Signal output 1 =
analogue output



Modbus RTU only

Line termination = OFF

Line termination = ON
150 Ω parallel to
Bus output A and B



Analogue output = current signal (e.g. 4 - 20 mA)

Analogue output = voltage signal (e.g. 0 - 10 V)

Fig. 9 Jumper positions

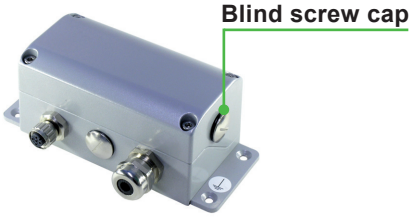
6.2 USB Configuration Interface

The USB connector is located behind the blind screw cap, at the side of the enclosure.

1. Remove the blind screw cap with a screwdriver
2. Plug in the USB cable which connects the sensor to the PC.

PLEASE NOTE

Install the configuration software that is included in the scope of supply. The configuration software can also be downloaded from our website www.epluse.com/ee771.



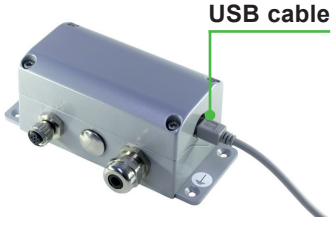
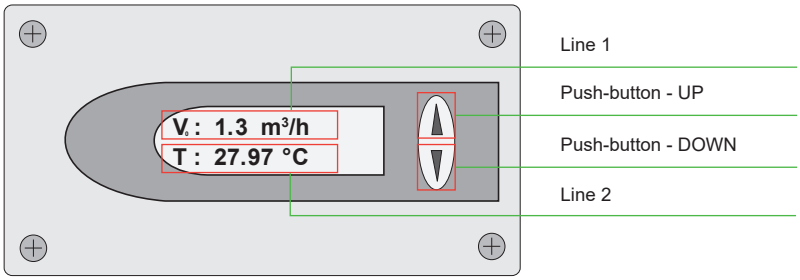


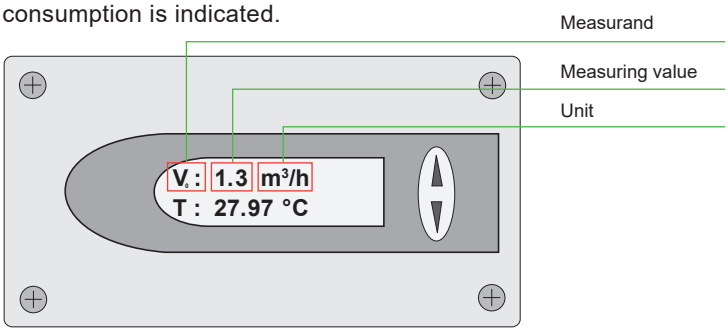
Fig. 10 USB interface connection

6.3 Display / Indicator with Keypad (Optional)

An optional 2-line display is available for the flow sensor EE771. The display is integrated into the enclosure cover and has two softkeys for controlling the display.



Depending on the configuration of the outputs either the measured values, the status of the relay or the consumption is indicated.



Measurand		SI Unit	US/GB Unit
v_0	Standardized flow / velocity	m/s	SFPM
T	Temperature	°C	°F
$\dot{V}_0$	Standardized volume flow	m^3/h, m^3/min; l/min	SCFPM, SLPM
$\dot{m}$	Mass flow	kg/h, kg/min; kg/s	kg/h, kg/min; kg/s
Q	Consumption reading	m^3	ft^3
p	Pressure	bar	psi

6.3.1. Indication of the Analogue and Pulse Output

Line 1 always indicates the configured measurand at output 1. In line 2 the desired measurement value can be displayed using the UP and DOWN keys.

6.3.2. Indication of the Switch Output

Line 1 indicates the status of the switch output. In line 2 the desired measurement value can be indicated using the UP and DOWN keys.

The display shows an inverse image if the relay output is active (relay has switched).

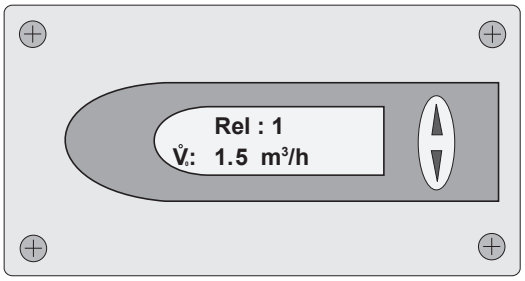


Fig. 11 Switch output inactive (relay has not switched)

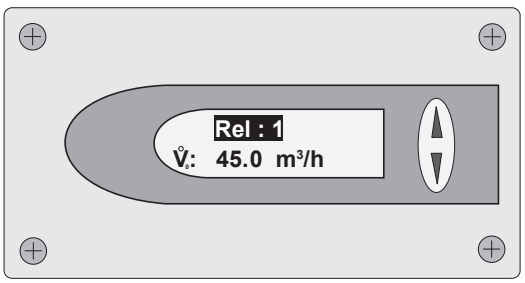
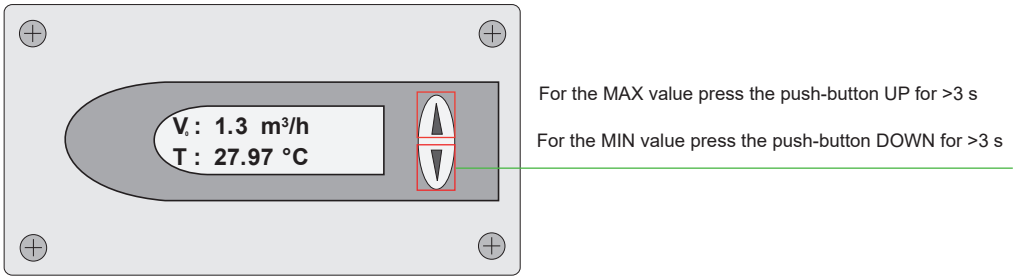


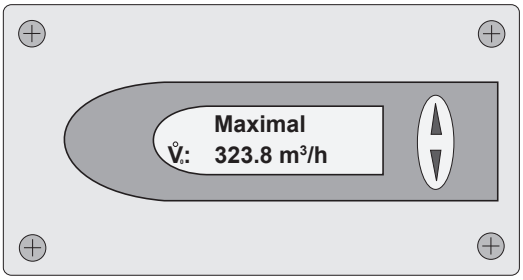
Fig. 12 Switch output active (relay has switched)

6.3.3. Indication of the MIN / MAX Values

Keep the DOWN key pressed for >3 seconds to indicate the MIN value.
Keep the UP key pressed for >3 seconds to indicate the MAX value.

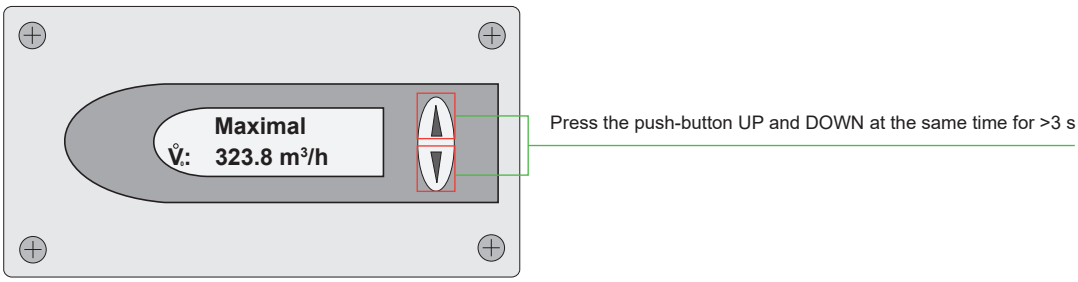


After that the several different measurement values can be indicated using the UP or DOWN keys.
Keep the UP or DOWN key pressed for >3 seconds to exit the MIN / MAX mode.

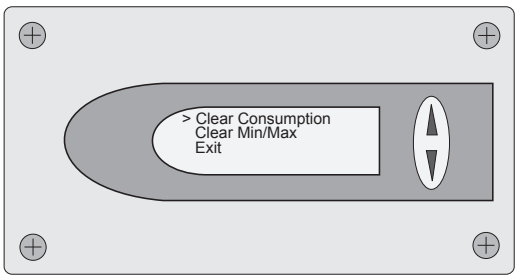


6.3.4. Reset of the Consumption Meter or the MIN / MAX Value

Keep both the UP and DOWN key pressed for >3 seconds to enter the menu for resetting the consumption meter or the MIN / MAX value. Select the desired menu item by pressing the UP or DOWN key briefly.



To confirm the selected choice of the menu keep the UP or DOWN key pressed for >3 seconds.Select menu item “NO” or “EXIT” to cancel without resetting.



6.3.5. Maximum Consumption Meter

The maximum consumption meter readout on the display is 999 999 999.0 m^3 or 99 999 999.0 ft^3. Then it shows “LCD maximum”. The internal memory continues counting. The maximum counter reading is $3.4*10^{38}$ m^3.
It is possible to read-out the counter reading with the configuration software.

6.4 Bus Output (Optional)

6.4.1. M-Bus (Meter-Bus)

The M-Bus (Meter Bus) is a field Bus for recording consumption data. Transmission is carried out serially on a reverse polarity protected 2-wire line. The flow sensor as an M-Bus slave requires a separate supply voltage. No specific topology (line or star) is prescribed for the cabling. Normal telephone cable of type J-Y(St)Y Nx2x0.8 mm can be used. A maximum of 250 meters is permitted per segment (primary address).

Read-out of the current measurement/consumption data

The following measurement/consumption values are transmitted during a standard query:

- Standardized volume flow (32 bit Real)
- Temperature (32 bit Real)
- Mass flow (32 bit Real)
- Consumption meter status (32 bit Real)
- Flow velocity (32 bit Real)

- Standardized volume flow (32 bit Integer)
- Temperature (32 bit Integer)
- Mass flow (32 bit Integer)
- Consumption meter status (64 bit Integer)
- Flow velocity (32 bit Integer)

The table below shows the package structure of the measurement/consumption data sent by the EE77x sensor:

Header	
68	Start of the telegram
4F 4F	L-field (length)
68	Second starting signal
08	C-field (RSP_UD)
XX	A-field (address)

Start User Data	
72	CI-field (variable data structure)
XX XX XX XX	Identification number
A5 16	Manufacturer (0x16A5 … EUE)
01	Version
09	Medium (9 … compressed air)
XX	Access number (continuous)
00	Status
00 00	Signature

Data Record 1: Volume Flow	
05	DIF (32 bit Real)
3E	VIF (Volume flow in m^3/h)
XX XX XX XX	Act. measuring value

Data Record 2: Temperature	
05	DIF (32 bit Real)
5B	VIF (Temperature in °C)
XX XX XX XX	Act. measuring value

Data Record 3: Mass Flow	
05	DIF (32 bit Real)
53	VIF (Mass flow in kg/h)
XX XX XX XX	Act. measuring value

Data Record 4: Consumption Meter Reading	
05	DIF (32 bit Real)
16	VIF (Volume in m^3)
XX XX XX XX	Act. measuring value

Data Record 5: Flow Rate	
05	DIF (32 bit Real)
7F	VIF (manufacturer specific in m/s)
XX XX XX XX	Act. measuring value

Data Record 6: Pressure	
05	DIF (32 bit Real)
6B	VIF (Pressure in bar)
XX XX XX XX	Act. measuring value

Data Record 7: Volume Flow	
04	DIF (32 bit Integer)
3B	VIF (Volume flow in 10^{-3} m^3/h)
XX XX XX XX	Act. measuring value

Data Record 8: Temperature	
04	DIF (32 bit Integer)
59	VIF (Temperature in 10^{-2} °C)
XX XX XX XX	Act. measuring value

Data Record 9: Mass Flow	
04	DIF (32 bit Integer)
51	VIF (Mass flow in 10^{-2} kg/h))
XX XX XX XX	Act. measuring value

Data Record 10: Consumption Meter Reading	
07	DIF (64 bit Integer)
13	VIF (Volume in 10^{-3} m^3)
XX XX XX XX	Act. measuring value

Data Record 11: Flow Rate	
04	DIF (32 bit Integer)
7F	VIF (manufacturer specific in 10^{-2}m/s)
XX XX XX XX	Act. measuring value

Data Record 12: Pressure	
04	DIF (32 bit Integer)
68	VIF (Pressure in 10^{-3} bar)
XX XX XX XX	Act. measuring value

End User Data	
XX	Checksum
16	End of the telegram

Tab. 4 Package structure of the measurement and consumption data

Secondary Addressing

In addition to primary addressing, the EE77x sensor provides the option of secondary addressing. The fields of identification number, manufacturer, version and medium are used together as the secondary address. The exact sequence of the secondary addressing is described in detail in the M-Bus Standard: https://m-bus.com/assets/downloads/MBDOC48.PDF.

6.4.2. Modbus RTU Register Map

The measured data is saved as 32 bit floating point values (data type FLOAT32). Depending on the measurement unit selected, measurements are saved in SI or US/GB units. The measurement unit can be changed using the configuration software.

For resetting the MIN / MAX values, write 0 to the corresponding write register.

For Modbus protocol setting please see Application Note AN0103 available at www.epluse.com/ee771.

FLOAT32

Parameter	SI Unit	US/GB Unit	Register number[1)] [DEC]	Register address[2)] [HEX]
Read register: function code 0x03 / 0x04				
Standardized flow	m/s	SFPM	026	19
Standardized volume flow	m^3/h	SCFPM	028	1B
Temperature	°C	°F	030	1D
Mass flow	kg/h	kg/h	032	1F
Consumption meter reading	m^3	ft^3	034	21
Pressure	bar	psi	036	23
MIN value standardized flow	m/s	SFPM	261	104
MAX value standardized flow	m/s	SFPM	263	106
MIN value standardized volume flow	m^3/h	SCFPM	265	108
MAX value standardized volume flow	m^3/h	SCFPM	267	10A
MIN value temperature	°C	°F	269	10C
MAX value temperature	°C	°F	271	10E
MIN value mass flow	kg/h	kg/h	273	110
MAX value mass flow	kg/h	kg/h	275	112
MIN value pressure	bar	psi	277	114
MAX value pressure	bar	psi	279	116

1) Register number starts from 1.
2) Register address starts from 0.

Tab. 5 EE771 FLOAT32 measured data registers

Write registers for resetting values (INT16)

Parameter	Register number[1)] [DEC]	Register address[2)] [HEX]
Write register: function code 0x06		
Reset MIN/MAX value standardized flow	261	104
Reset MIN/MAX value standardized volume flow	262	105
Reset MIN/MAX value temperature	263	106
Reset MIN/MAX value mass flow	264	107
Reset MIN/MAX value pressure	265	108

1) Register number starts from 1.
2) Register address starts from 0.

Tab. 6 EE771 write registers for value resetting

6.4.3. Data Transmission

	Factory settings		Selectable values	
	M-Bus	Modbus RTU	M-Bus	Modbus RTU
Baud rate	2 400	9 600	600...9 600	9 600...57 600
Data bits	8	8	8	8
Parity	Even	Even	None, Odd, Even	None, Odd, Even
Stop bits	1	1	1 or 2	1 or 2
Address	1	1	0...254	1...247

Tab. 7 M-Bus and Modbus RTU protocol settings

6.4.4. Device Address

The DIP switches on the electronics board can be used to set the device address directly on-board or to switch to software configuration.

The flow sensors are factory-set to address 1.

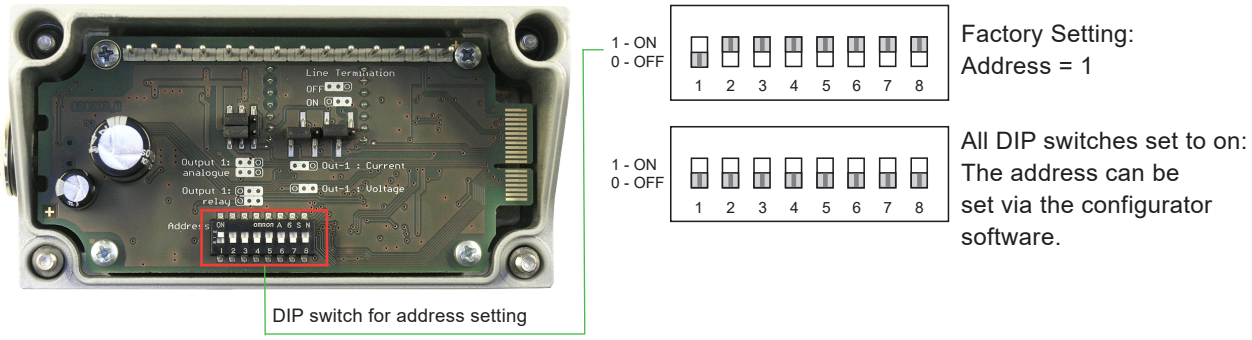


Fig. 13 Address setting

7 Maintenance and Service

7.1 Error Messages

In case the flow sensor is equipped with the optional display, the following error message can be indicated.

Error Category	Error Description	Recommended Action
01	Sensing probe is not detected or defect. The display indicates “0” for all measurands. The analogue output defaults to the lowest configured value.	Check the head of the sensing probe for visual damage.
		Check the sensor cable from the sensing probe to the electronics of the signal conditioning
02	The EEPROM for storing of the consumption meter and MIN / MAX value is defect. The consumption meter and MIN / MAX values are no longer available. All measurement values are still indicated. The analogue, relay and pulse output are still functional.	Return the faulty unit to E+E for service

Tab. 8 Explanation of the error category

7.2 Maintenance

Regular cleaning of the sensor is required for applications in wet or filthy gases. The sensor must be cleaned before calibration or evaluation.

Removal of the Sensing Probe of the Flow Sensor

⚠ WARNING

Working with a pressurised piping system may cause safety risks for people and the entire measurement installation.

Never remove the flow sensor while the measurement ball valve is open.

1. Shut-off the measurement valve with the shut-off function (see chapter 4.4 Assembly of the Measurement Ball Valve).
2. Turn off the power supply, remove the cover and disconnect the power wires from the screw terminal.
3. Loosen the retainer nut and pull the sensor probe from the measurement section.

For operation without the flow sensor installed please refer to chapter 4.4.1 Assembly without Flow Sensor, but With Screw Cap Instead (Blind Cap).

7.3 Cleaning the Sensing Element of the Flow Sensor

Clean the head of the sensor probe by carefully swirling it in warm water or isopropyl alcohol. It is recommended to use isopropyl alcohol if the pollution is grease or oil.

PLEASE NOTE

Do not use an abrasive cleaning agent, an organic solvent containing halogen or acetone.

PLEASE NOTE

Do not touch the sensor with fingers or solid objects like screwdrivers or brushes.

Let the device dry in the ambient air.

7.4 Repairs

Repairs are to be carried out by the manufacturer only. The attempt of unauthorized repair invalidates any warranty claims.

8 Replacement Parts / Accessories

8.1 Order Code Replacement Sensor

	Feature	Description	Code	
			PE771-	
Hardware Configuration	Type	Compact ri-le, flow direction right to left	T19	
		Compact le-ri, flow direction left to right	T20	
		Remote probe		T3
	Measuring range	Low - 0...100 m/s (328.1 ft/s)	HV31	HV31
		High - 0...200 m/s (656.2 ft/s)	HV33	HV33
	Measurement valve for pipe diameter	DN15	N15	N15
		DN20	N20	N20
		DN25	N25	N25
		DN32	N32	N32
		DN40	N40	N40
		DN50	N50	N50
	Electrical connection	Cable gland and screw terminals	No code	
		1x plug for power supply and outputs	E4	

Order Examples

PE771-T19HV31N25E4

Feature	Code	Description
Type	T19	Compact ri-le, flow direction right to left
Measuring range	HV31	Low - 0...100 m/s (328.1 ft/s)
Measurement valve for pipe diameter	N25	DN25
Electrical connection	E4	1x plug for power supply and outputs

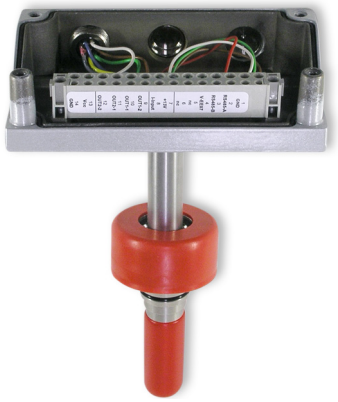


Fig. 14 Replacement sensor, compact ri-le

PE771-T3HV31N25

Feature	Code	Description
Type	**T3**	Remote probe
Measuring range	**HV31**	Low - 0...100 m/s (328.1 ft/s)
Measurement valve for pipe diameter	**N25**	DN25
Electrical connection	**No code**	Cable gland and screw terminals

Fig. 15 Replacement sensor, remote probe

8.2 Order Code Miscellaneous

Description		Code
Measurement ball valve	**DN15**	**HA075015**
	DN20	**HA075020**
	DN25	**HA075025**
	DN32	**HA075032**
	DN40	**HA075040**
	DN50	**HA075050**
Probe cable (for type T3)		
Cable length	**2 m**	**HA010816**
	5 m	**HA010817**
	10 m	**HA010818**
Screw cap (blind cap)		**HA010201**

9 Technical Data

Measurands

Volume Flow (V'n)

Standard conditions			Factory setting according to DIN 1343 pn = 1 013.25 mbar (14.7 psi), Tn= 0 °C (32 °F)	
Measuring range Standardized volume flow in				
	Medium	**Pipe-diameter**	**HV31**	**HV33**
	Air	**DN15 (1/2")**	0.32...63 m^3/h (0.19...37.1 SCFM)	0.32...126 m^3/h (0.19...74.1 SCFM)
		DN20 (3/4")	0.57...113 m^3/h (0.34...66.5 SCFM)	0.57...226 m^3/h (0.34...133 SCFM)
		DN25 (1")	0.90...176 m^3/h (0.53...103.5 SCFM)	0.90...352 m^3/h (0.53...207.1 SCFM)
		DN32 (1 1/4")	1.45...289 m^3/h (0.85...170.0 SCFM)	1.45...578 m^3/h (0.85...340 SCFM)
		DN40 (1 1/2")	2.26...452 m^3/h (1.33...265.9 SCFM)	2.26...904 m^3/h (1.33...531.8 SCFM)
		DN50 (2")	3.50...700 m^3/h (2.06...411.8 SCFM)	3.50...1 400 m^3/h (2.06...823.6 SCFM)
Measuring range Standardized flow in				
	Medium	**Pipe-diameter**	**HV31**	**HV33**
	Air, CO_2, Nitrogen, Argon	**≤DN50 (2")**	0.5...100 m/s (100...19 685 SFPM)	0.5...200 m/s (100...39 370 SFPM)
	O_2	**≤DN25 (1")**	0.5...77 m/s (100...15 157 SFPM)	0.5...200 m/s (100...39 370 SFPM)
Accuracy [1)] in air @ 7 bar (101.5 psi) (abs) and 23 °C (73 °F)			±(1.5 % of measured value + 0.5 % of full scale)	
Temperature dependency			±(0.1 % of measured value/°C)	
Response time t_{90}, typ.			<1 s	
Sampling interval			0.1 s	

1) The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement). The accuracy specifications apply when using inlet and outlet sections of suitable length, see Accessories and chapter 4.3 Required Length of Straight Pipe.

Temperature (T)

Measuring range	-20...+80 °C (-4...+176 °F)
Accuracy @ 20 °C (68 °F)	±0.7 °C (±1.26 °F)

Outputs

Analogue

Signal range and measurands are freely configurable	0 - 10 V 4 - 20 mA 3-wire 0 - 20 mA 3-wire		0 mA < I_L < 1 mA R_L < 500 Ω R_L < 500 Ω	I_L = load current R_L = load resistance

Switch output	Potential free, max. 44 V DC, 500 mA switching capacity
Pulse output	Totalizer, pulse length: 0.02...2 s

Digital (optional)

Digital interface	RS485 (EE771 = 1 unit load)
Protocol[1)] **Factory settings** **Supported Baud rates** **Measured data types**	Modbus RTU 9 600 Baud, parity even, 1 stop bit, Modbus address 1 9 600, 19 200, 38 400 and 57 600 FLOAT32
Protocol[2)] **Factory settings** **Supported Baud rates**	M-Bus 2 400 Baud, parity even, 1 stop bit, M-Bus address 1 600, 1 200, 2 400, 4 800 and 9 600

1) Find more details about communication setting in chapter 6.4 Bus Output (Optional) and the Modbus Application Note at www.epluse.com/ee771.
2) Find more details about communication setting in chapter 6.4 Bus Output (Optional).

Input

External Dynamic Pressure Compensation

Requirements to the pressure sensor	4 - 20 mA (2-wire, 15 V) (relevant for gases other than air and nitrogen)

General

Power supply class III ⧫ USA & Canada: Class 2 supply necessary, max. voltage 30 V DC		18 - 30 V AC/DC
Current consumption, max.		<200 mA (with display)
Electrical connection		Cable gland M16 and screw terminals max. 1.5 mm² (AWG 16), optional with connector M12x1, 8 poles
Nominal pressure		16 bar (232 psi)
Humidity range		0…100 %RH, non-condensing
Temperature range	**Ambient, Storage** **Medium**	-20...+60 °C (-4...140 °F) -20...+80 °C (-4...+176 °F)
Material	**Enclosure** **Probe** **Probe head** **Measurement valve**	AlSi9Cu3 (Metal) Stainless steel Stainless steel / glass Brass
Protection rating	**Enclosure**	IP65 / NEMA 4X
Electromagnetic compatibility		EN 61326-1 EN 61326-2-3 Industrial environment FCC Part15 Class B ICES-003 Class B
Conformity		CE UKCA

Factory Setting of Outputs – SI Units

Analogue output [0 - 10 V / 0 (4) - 20 mA]		From	To		Unit
			Low (HV31)	High (HV32)	
Standardized volume flow	**DN15**	0	60	120	m^3/h
	DN20	0	110	220	m^3/h
	DN25	0	175	350	m^3/h
	DN32	0	285	570	m^3/h
	DN40	0	450	900	m^3/h
	DN50	0	700	1 400	m^3/h
Mass flow	**DN15**	0	75	150	kg/h
	DN20	0	140	280	kg/h
	DN25	0	220	440	kg/h
	DN32	0	360	720	kg/h
	DN40	0	570	1 140	kg/h
	DN50	0	890	1 780	kg/h
Standardized flow	**≤DN50**	0	100	200	m/s
Temperature	**all Ø**	-20	80	80	°C

Switching output		From	To	Unit
		Switching point / Hysteresis		
Standardized volume flow	**DN15**	50/5	100/10	m^3/h
	DN20	90/9	180/18	m^3/h
	DN25	150/15	300/30	m^3/h
	DN32	230/23	460/46	m^3/h
	DN40	360/36	720/72	m^3/h
	DN50	560/56	1 120/112	m^3/h
Mass flow	**DN15**	60/6	120/12	kg/h
	DN20	110/11	220/22	kg/h
	DN25	200/20	400/40	kg/h
	DN32	290/29	580/58	kg/h
	DN40	460/46	920/92	kg/h
	DN50	700/70	1 400/140	kg/h
Standardized flow	**≤DN50**	80/8	180/18	m/s
Temperature	**all Ø**	30/3	70/7	°C

Pulse output

Pulse value = 1 m^3	Pulse duration = 0.1 s

Factory Setting of Outputs – US Units

Analogue output [0 - 10 V / 0 (4) - 20 mA]		From	To		Unit
			Low (HV31)	High (HV32)	
Standardized volume flow	**DN15**	0	35	70	SCFM
	DN20	0	60	120	SCFM
	DN25	0	100	200	SCFM
	DN32	0	165	330	SCFM
	DN40	0	260	520	SCFM
	DN50	0	410	820	SCFM
Mass flow	**DN15**	0	75	150	kg/h
	DN20	0	140	280	kg/h
	DN25	0	220	440	kg/h
	DN32	0	360	720	kg/h
	DN40	0	570	1 140	kg/h
	DN50	0	890	1 780	kg/h
Standardized flow	**≤DN50**	0	20 000	40 000	SFPM
Temperature	**all Ø**	-4	176	176	°F

Switching output		From	To	Unit
			Switching point / Hysteresis	
Standardized volume flow	**DN15**	30/3	60/6	SCFM
	DN20	50/5	100/10	SCFM
	DN25	80/8	160/16	SCFM
	DN32	130/13	260/26	SCFM
	DN40	210/21	420/42	SCFM
	DN50	330/33	660/66	SCFM
Mass flow	**DN15**	60/6	120/12	kg/h
	DN20	110/11	220/22	kg/h
	DN25	200/20	400/40	kg/h
	DN32	290/29	580/58	kg/h
	DN40	460/46	920/92	kg/h
	DN50	700/70	1 400/140	kg/h
Standardized flow	**≤DN50**	15 000/1 500	30 000/3 000	SFPM
Temperature	**all Ø**	90/9	150/15	°F

Pulse output

Pulse value = 1 CF	Pulse duration = 0.1 s

10 Configuration Software

10.1 Introduction

The configuration software allows for a user-friendly adaptation of the flow sensor to the application. In addition, the measurement values for flow and temperature can be calibrated / adjusted.

The configuration software can be downloaded free of charge at www.epluse.com/ee771.

LIMITED LIABILITY

E+E Elektronik shall not be held liable for any damages or consequential damages (for example, but not restricted to, loss of earnings, interruption of business, loss of information and data or any other financial losses) resulting from the installation, use or impossibility of use of an E+E Elektronik software product and any associated support services or non-performance of support services.

The system requirements for the installation and execution of the software are:

- Windows XP with SP3, Windows Vista or Windows 7
- .NET framework 3.5 with SP1
- USB 2.0 interface

PLEASE NOTE

During setup there will be no installation of .NET Framework 3.5 SP1 – if the required version is not already installed on the computer, the following error message will appear at the start of the configuration software. .NET Framework 3.5 SP1 can be installed using Windows Update.

10.2 Installation

In order to set up a smooth installation of the configuration software of the EE771, admin authorization for the personal computer is required.

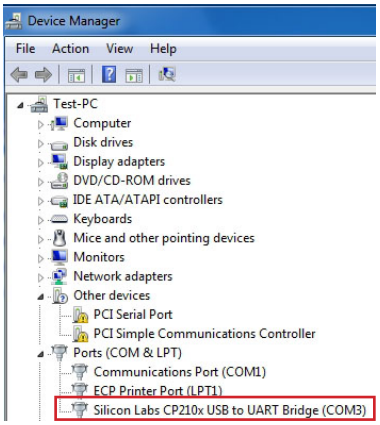
- During installation of the software the EE771 should NOT be connected to the computer via the USB cable.
- With Setup.exe the InstallShield-Wizard for the EE771 configurator will be started.
- Follow the instructions on the screen to install the software.

PLEASE NOTE

- First, the configuration software is installed, then the installation of the USB driver is activated - unless the user has specified that the USB setup is disabled.
- The USB driver will be installed automatically the moment the first connection is made with the EE771.
- The dialogue boxes that appear can be handled with the settings "No. Do not download driver from the Internet" and "Install the hardware automatically".

If the EE771 configuration software and the USB driver are installed correctly, and the EE771 is connected to the personal computer via the USB interface, a connection “Silicon Labs C210x USB to UART Bridge” should have been created in the device manager.

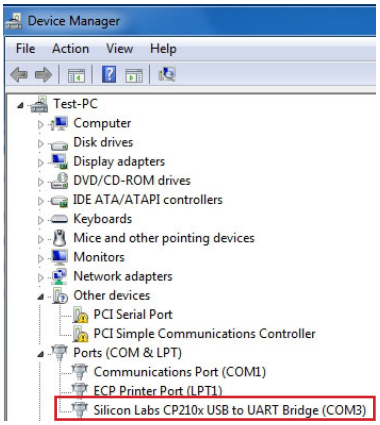
See: Start → Settings → Control Panel → System → Hardware → Device Manager



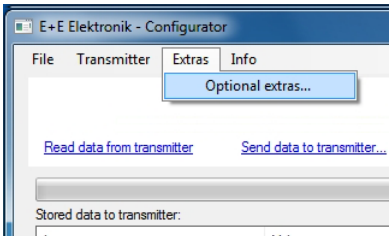
Configuration of the USB Interface (VirtualCOM)

After the startup of the software, the correct VirtualCOM interface for the USB driver must be configured. The number for the used USB interface can be found under:

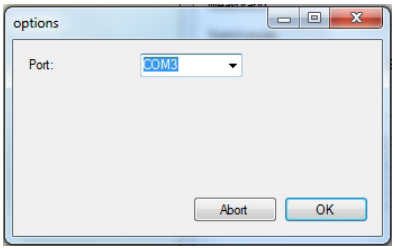
Start → Settings → Control Panel → System → Hardware → Device Manager



The setting is done under menu “Extras” and menu item “Optional extras ...”



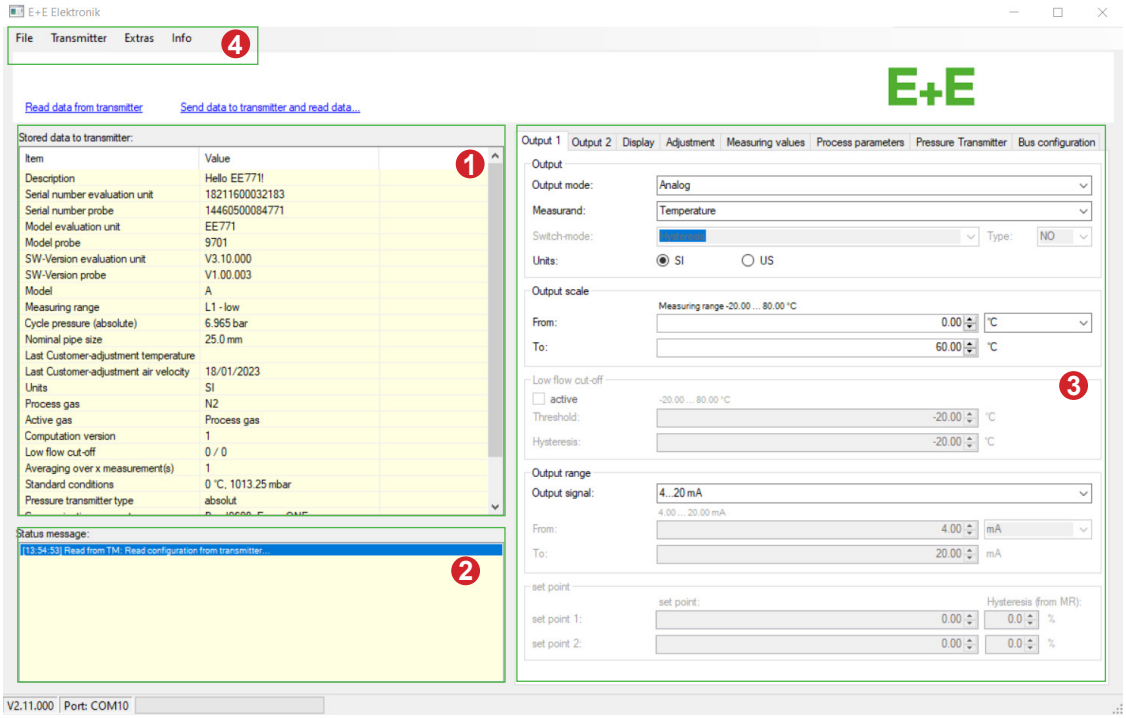
Select the COM-port number as shown in the device manager.



PLEASE NOTE

These settings are done only once and at the first start of the configuration software. The settings are stored for future use.

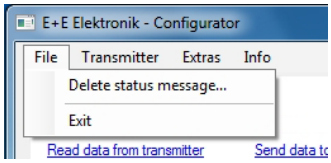
10.3 User Interface



No.	Function
1	**Basic information:** After retrieving the data from the sensor, the basic information of the device is shown here.
2	**Status message:** Here the status messages and other information are displayed.
3	**Input screen:** Input screen for the configuration or adjustment of the flow sensor.
4	**Menu tool bar:** Selection of menu items.

10.4 Menu Toolbar

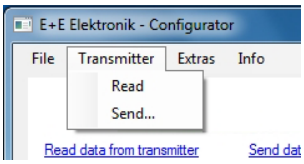
10.4.1. File

Menu	Item	Description
	Delete status message	Deletes the status messages.
	Exit	Closes the configuration software.

10.4.2. Transmitter

PLEASE NOTE

The term “Transmitter” is used synonymously with “Sensor” in this user manual.

Menu	Item	Description
	Read	Reads the actual configuration of the transmitter.
	Send	Uploads the “new” configuration to the transmitter. The following settings are uploaded to the transmitter. ▪ Units ▪ Output 1 ▪ Output 2 ▪ Display mode ▪ Pressure transmitter

Prior to uploading the “new” configuration to the transmitter, a dialog box will show a summary of the changes. Click on the button “OK” and the configuration will be uploaded to the transmitter, click “Cancel” to cancel the operation.

10.4.3. Extras

Configurations of the VirtualCOM interface (see "Configuration of the USB Interface (VirtualCOM)" in chapter 10.2 Installation).

10.5 Input Screen

10.5.1. Output 1, Output 2

In this screen the actual settings of the transmitter for the outputs 1 and 2, resp. relay 1 and 2 are shown. The user can alter and upload these settings to the transmitter, together with other changes of the configuration.

Output Mode

Here the mode of signal output can be determined.

- Output 1: Analogue or switch (relay) output
- Output 2: Switch (relay) or pulse output

PLEASE NOTE

In case the mode of output 1 is changed, the Jumper J1 on the board of the signal conditioning electronics has to be relocated as well (see chapter 6.1 Jumper J1 and J2).

Measurand

Here it is determined which measurand will be represented at the particular output.

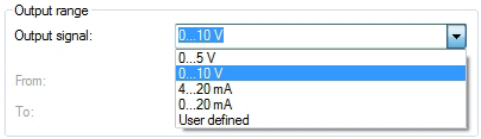
Units

Choice of the engineering units of the selected measurand in either SI- (m/s; °C; m^3/h) or US-units (SFPM; °F; SCFM).

PLEASE NOTE

The setting “Units” on the tabs for Output 1 and Output 2 are in sync with each other. If the units are changed on one of the output tabs, automatically the units on the other output tab are changed accordingly.

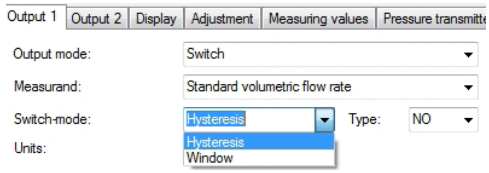
Output Mode – Analogue

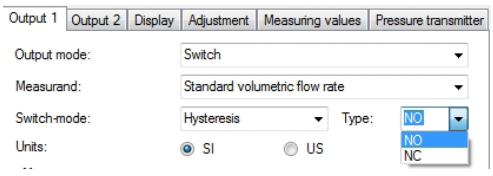
Menu	Description
	Within the limits of measurement range and the scaling of the output, the analogue output can be freely configured and scaled. Either a standard output signal (0 - 5 V, 0 - 10 V, 0 - 20 mA, 4 - 20 mA) can be selected or a user defined range for the current / voltage output (e.g. 1 - 9 V).

PLEASE NOTE

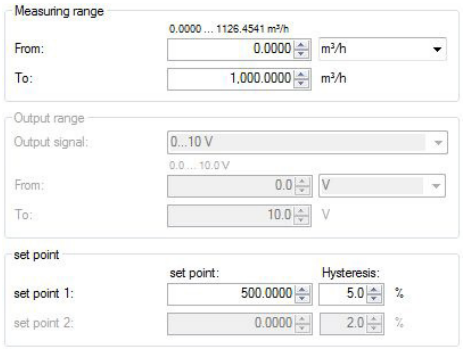
In case the analogue output is changed (from current to voltage or vice versa), the Jumper J2 on the board of the signal conditioning electronics has to be relocated as well (see chapter 6.1 Jumper J1 and J2).

Output Mode – Switch (Relay)

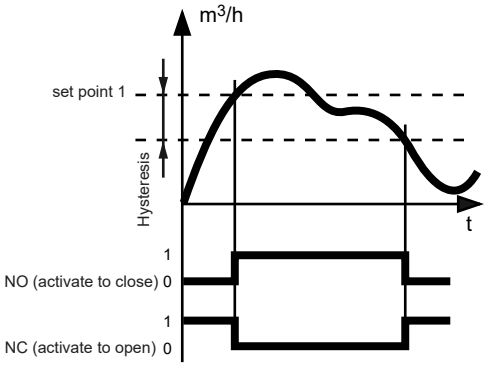
Menu	Description
	In the field for the “Switch-mode”, one can select “Hysteresis” or “Window”.

Menu	Description
	The field “Type” is to determine the switch action of the relay, NO = Normally Open (activate to close), NC = Normally Close (activate to open).

Under “Measuring range” in the field “From” the low value of the measuring range can be entered and the high value in the field “To”.

Menu	Description
	The hysteresis of the set point is entered as a percentage of the measuring range. [Measuring range] = high measuring value - low measuring value e.g. hysteresis Set point = 500 m^3/h and reset point is 450 m^3/h Hysteresis = 50 m^3/h = 0.5 % of measuring range

Hysteresis

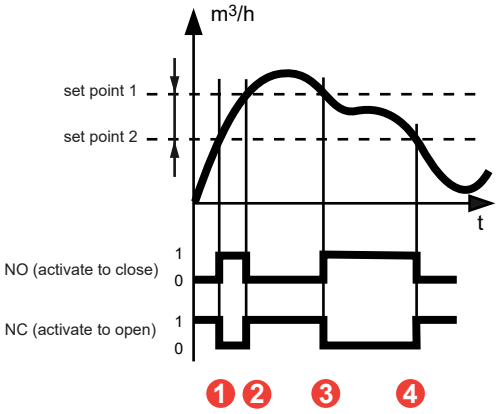


When the measurement value reaches set point 1, the relay will be activated. The value at the reset point is the value at set point 1 minus the hysteresis.

e.g. set point 1 = 100 m^3/h and the hysteresis 5 m^3/h. The relay switches at 100 m^3/h. The reset point is at 96 m^3/h.

Hysteresis = 5 m^3/h = 5 % of the measuring range

Window



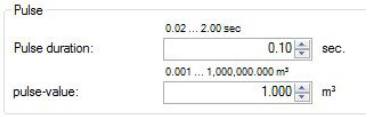
No.	Data
1	80 m^3/h = set point 2
2	100 m^3/h = set point 1
3	99 m^3/h = set point 1 - hysteresis
4	79 m^3/h = set point 2 - hysteresis

Output Mode – Pulse

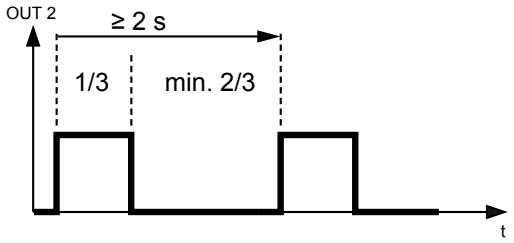
If output 2 is configured for pulse, the measurand can only be consumption. The duration of the pulse and the pulse value (significance level of the pulse) can be freely configured under “Pulse”.

$$\frac{\text{Volume Flow } [m^3/h]}{\text{Pulse Value } [m^3/\text{Pulse}]} = \frac{\text{Number of Pulses}}{\text{Hour}}$$

The duration of the pulse can be set between 0.02 and 2 seconds.

Menu	Description
	e.g. duration of pulse = 100 ms; one pulse for each m^3 consumed

The pulse/interval ratio must be at least 1:2, meaning that the duration of the pulse interval must be at least twice the duration of the pulse itself.



Calculation of the minimum “pulse value” or the maximum “pulse duration”.

IMPW_MIN = NORMV_MAX [m^3/h] * IMPL [s] / 1200

IMPL_MAX = IMPW [m^3] * 1200 / NORMV_MAX [m^3/h]

Short Form	Description
IMPW	Pulse value [m^3]
IMPL	Pulse length (duration) [s]
IMPW_MIN	Minimum pulse value [m^3]
IMPL_MAX	Maximum pulse length (duration)
NORMV_MAX	Expected maximum volume flow (m^3/h)

10.5.2. Minimum Flow Shutdown

The minimum flow shutdown is switched on and off using the “active” checkbox.

If the output signal is ≤ than the set “Shutdown value”, the flow sensor issues 0 on the analogue output.

10.5.3. Display

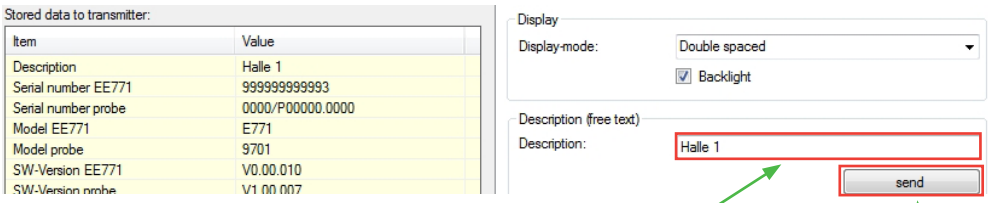
If an optional display is installed, at the tab Display the following items can be entered:

Drop-down input field “Display-Mode”

- Single spaced
- Double spaced (default)

Checkbox “Backlight”

- Checked = ON
- Unchecked = OFF



In the input field “Description (free text)”, a user specific name (max. 16 characters) for the transmitter can be entered. E.g.: HALL 1

With the button “send” only the description will be uploaded to the transmitter.

10.5.4. Adjustment

The user can perform an adjustment for the measurands normflow and temperature in air.

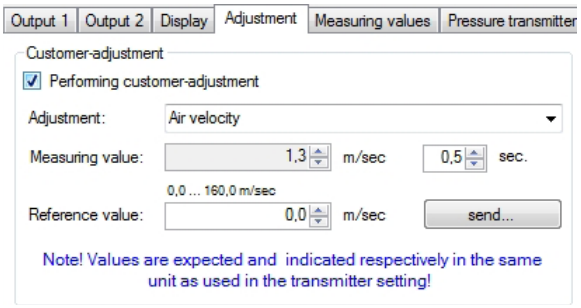
The configuration software automatically distinguishes between a 1-point and a 2-point adjustment, depending on how many reference points for adjustments are entered.

The values entered for the customer’s adjustment are stored in the electronics of the sensing probe and are therefore not lost if the electronics of the signal conditioning are replaced (see chapter 3 Product Description)

If the checkbox “Performing customer-adjustment” is checked, the adjustment mode will be activated and the actual measuring value in the set interval automatically retrieved from the flow sensor (transmitter).

PLEASE NOTE

- At first change to “Calibration gas” in the tab “Process parameters”.
- While the customer-adjustment is active all other pages, functions and commands are deactivated.

Menu	Item	Description
	Adjustment	The measurand to be adjusted is selected
	Measuring value	The actual measurement value of the transmitter is indicated. The update-interval can be set.
	Reference value	The measurement value of the standard is entered.

After clicking the “send” button, a control dialog box appears in which the values can be corrected if necessary. The reference value is then loaded into the flow sensor (transmitter) and the setting process is complete.

The reference point of the customer-adjustment must be within the determined measuring range.

The customer-adjustment results in a slight rotation of the characteristic line, in such a way that the measurement deviation at the upper and lower adjustment points equals zero.

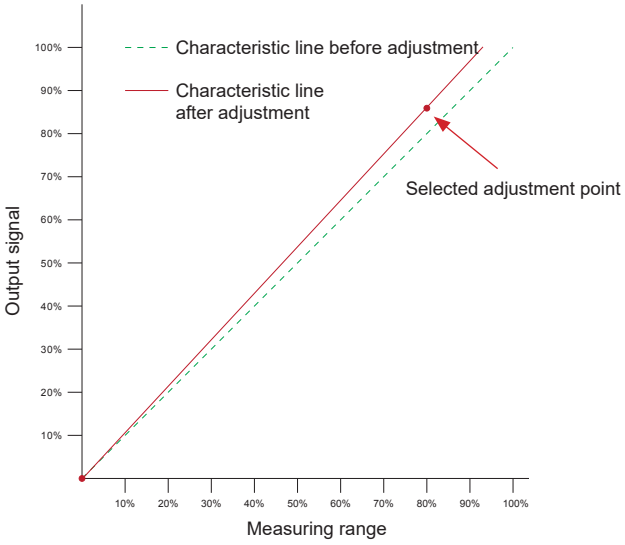
The configuration software determines, depending on its position, if it is an upper or lower adjustment point.

1-point Adjustment

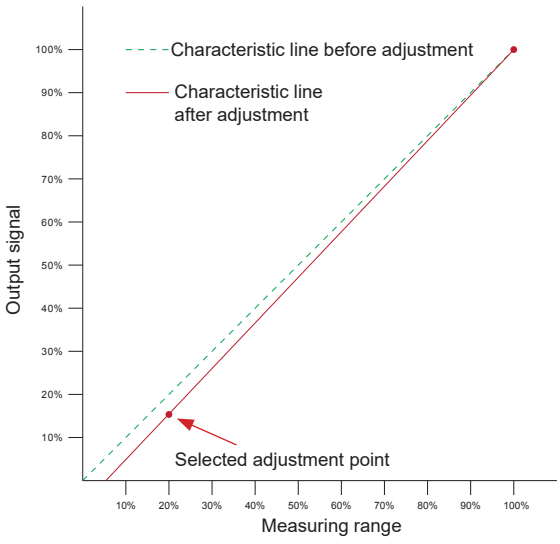
Possibility	Lower adjustment point	Upper adjustment point
1	0 - 50 % of m.r.	100 % of m.r.
2	0 % of m.r.	>50 - 100 % of m.r.

m.r. = measuring range

Upper adjustment point at 80% of measuring range
Lower adjustment point automatically at 0% of m.r.



Lower adjustment point at 20% of measuring range
Upper adjustment point automatically at 100% of m.r.



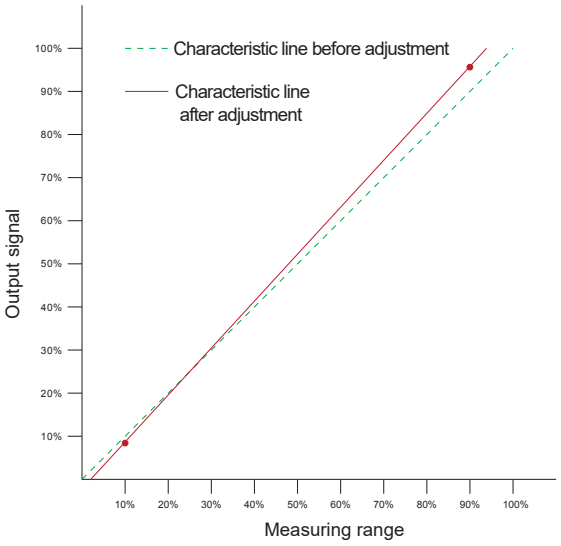
2-point Adjustment

With a 2-point adjustment procedure the lower adjustment point must be between 0 and 40% of the measuring range and the upper adjustment point between 60 and 100% of the measuring range. If the adjustment point is between 40 and 60% of the measuring range, automatically a 1-point adjustment procedure will be executed instead.

Possibility	Lower adjustment point	Upper adjustment point
1	0 ... <40 % of m.r.	60...100 % of m.r.
2	40 ... <50 % of m.r.	100 % of m.r.
3	0 % of m.r.	50 - <60 % of m.r.

m.r. = measuring range

Lower adjustment point at 10% of measuring range
Upper adjustment point at 90% of measuring range

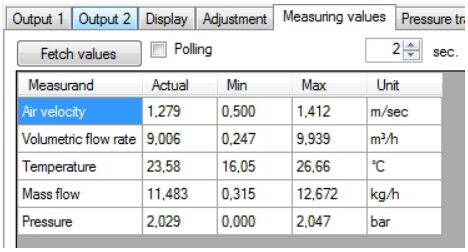


Reset to Factory Settings

Customer-adjustment can be reset to the factory settings by checking the appropriate checkbox and subsequently clicking the “reset” button.

10.5.5. Measuring Values Overview

The tab “measuring values” provides an overview of the retrieved actual measurement values of the flow sensor (transmitter).

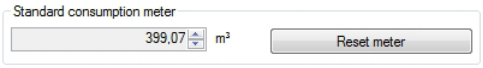
Menu	Description
	Clicking on “Fetch values” will retrieve the actual measurement and MIN / MAX values for flow, volume flow, temperature, mass flow and pressure (only if a pressure transmitter is connected) from the transmitter – additional the reading of the consumption meter is retrieved as well. Checking the “Polling” checkbox will retrieve the measuring data from the transmitter at the selected interval.

Reset of the MIN / MAX Values

The MIN / MAX values of each measurand, as stored in the flow sensor (transmitter), can be reset by checking the appropriate checkbox and subsequently clicking the “Clear MIN / MAX” button.

Reset of the Consumption Meter (Totalizer)

The reading of the consumption meter can be reset by clicking the “Reset meter” button.



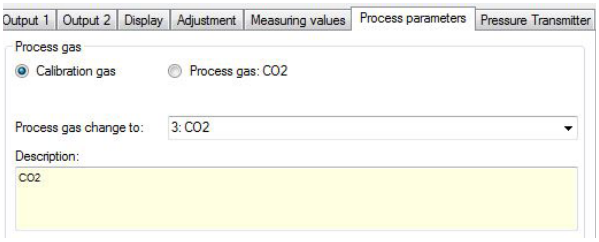
10.5.6. Setting up Process Parameters

In the tab “Process Parameters” the Process gas (medium) can be changed and the pressure compensation can be set.

Change the Process Gas

PLEASE NOTE

This function is only active if the flow sensor has been ordered (see order code “Medium” in the datasheet) for a medium other than air.

Menu	Item	Description
	Calibration gas	The gas (medium) in which the flow sensor was calibrated in the factory. Unless otherwise specified, the flow sensor is always calibrated in air at the factory.
	Process gas	The gas (medium) in the measured process. The adjustable process gases are set at the factory and can be selected from a list.

The flow sensor is factory set to the ordered gas (medium). If the setting for the process gas is modified or changed between calibration and process gas, the changed setting has to be sent to the transmitter. Use “send data to the transmitter and read ...” button. The “active gas” to which the flow sensor is set can be seen in the basic information field.

Units	US
Process gas	CO2
Active gas	Calibration gas
Computation version	1

Changing the Standard Conditions

The flow sensor is factory-set to standard conditions conforming to DIN 1343.
Factory setting: pn = 1013.25 mbar, Tn = 0 °C (32 °F).
The corrected volume flow value is calculated in line with the standard conditions set.

Pressure Compensation

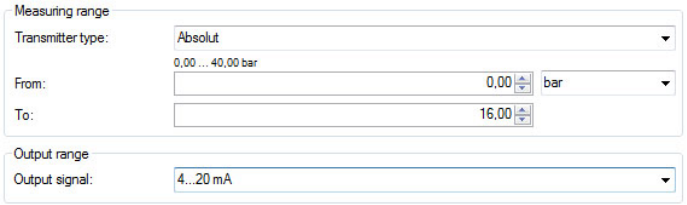
The flow sensor is factory-adjusted to 7 bar (abs). At an operating pressure other than 7 bar (abs), the error can be corrected via the pressure coefficient of +0.5% of the measured value per bar by entering the actual system pressure.

The “Send” button is used only to send the process pressure to the transmitter.

10.5.7. External Pressure Sensor for Pressure Compensation

In order to achieve the highest accuracy, the input from an external pressure transmitter will be very useful if the pressure fluctuates strongly (e.g. 3 to 10 bar (45 to 150 psi)). An absolute pressure transmitter with a 2-wire loop, powered 4 - 20 mA output, should be used.

On the tab “Pressure transmitter” the measuring range can be entered.



10.5.8. Bus Configuration

If the flow sensor is equipped with an optional bus module, the data transfer rate and the network address can be set on the “Bus configuration” tab.

The network address set is only used when the DIP switches on the flow sensor PCB are set to 255 (see 6.4.1 M-Bus (Meter-Bus)).

11 Conformity

11.1 Declarations of Conformity

E+E Elektronik Ges.m.b.H. hereby declares that the product complies with the respective regulations listed below:

CE European directives and standards

and

UK CA UK statutory instruments and designated standards

Please refer to the product page at www.epluse.com/ee771 for the Declarations of Conformity.

11.2 FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

11.3 ICES-003 Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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